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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

FCC 93-350

In the Matter of	)	
	)	
Redevelopment of Spectrum to	)	ET Docket No. 92-9
Encourage Innovation in the	)	RM-7981
Use of New Telecommunications	)	RM-8004
Technologies	)	

SECOND REPORT AND ORDER

Adopted: July 15, 1993

Released: August 13, 1993

By the Commission:

TABLE OF CONTENTS

<u>Topic</u>	<u>Paragraph No.</u>
INTRODUCTION	1 - 2
BACKGROUND	3 - 7
DISCUSSION	8 - 75
Allocation and Channelization	9 - 43
4 GHz	9 - 16
6 GHz	17 - 29
10 GHz	30 - 38
11 GHz	39 - 43
Minimum Channel Loading and Data Rates	44 - 55
Expansion of Existing Systems Under Current Channel Plans	56 - 57
Coordination Procedures and Interference Standards	58 - 60
Reservation of Growth Channels	61 - 63
Antenna Standards	64 - 67
Automatic Transmit Power Control	68 - 70
Other Technical Issues	71 - 72
Use of Government Spectrum	73 - 74
Summary	75
PROCEDURAL MATTERS	76 - 80
RULE CHANGES	Appendix A
COMMENTING PARTIES	Appendix B

## INTRODUCTION

1. By this action, the Commission reallocates five bands above 3 GHz to the private operational and common carrier fixed microwave services on a co-primary basis and prescribes channelization plans and technical rules to govern their use. These rules ensure that fixed microwave licensees relocating from 1850-1990, 2110-2150, and 2160-2200 MHz frequencies (2 GHz band) will have available alternative frequency bands that are suitable for providing equivalent service with comparable reliability.

2. Today's action follows our reallocation of the 2 GHz band from private operational and common carrier fixed microwave use to emerging technology mobile services, subject to grandfathering provisions and other conditions. The reallocation of 2 GHz frequencies from fixed to mobile use, together with voluntary negotiated moves and the mechanisms further refined today in a companion order, facilitates making available the spectrum necessary for the U.S. telecommunications industry to develop and provide leading edge products and services.<sup>1</sup> Our action in this Second Report and Order, reallocating spectrum in bands above 3 GHz to which 2 GHz fixed licensees may move, ensures that these licensees will not be disadvantaged by the emerging technologies reallocation.

## BACKGROUND

3. In the First Report and Order in this proceeding we reallocated to emerging telecommunications technologies the 1850-1990, 2130-2150, and 2180-2200 MHz bands allocated to the Private Operational-Fixed Microwave Service (Part 94) and the 2110-2130 and 2160-2180 MHz bands allocated to the common carrier Domestic Public Fixed Radio Services (Part 21) and Public Mobile Service (Part 22).<sup>2</sup> In taking this action, the Commission stated its intention to make available fixed microwave bands above 3 GHz to reaccommodate incumbent 2 GHz fixed microwave licensees in geographic areas where sharing would not be possible due to potential interference between the services. The

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<sup>1</sup> In our companion order we decide that 2 GHz fixed microwave licensees in spectrum allocated to licensed emerging technology services will not be required to relocate for a period of three years, and 2 GHz fixed licensees in spectrum allocated to unlicensed emerging technology devices will not be required to relocate for a period of one year. We also refine our voluntary negotiation scheme that governs relocation efforts. See Third Report and Order and Memorandum Opinion and Order, ET Docket No. 92-9, released August 13, 1993.

<sup>2</sup> First Report and Order and Third Notice of Proposed Rule Making, ET Docket No. 92-9, 7 FCC Rcd 6886 (1992).

Commission stated that such reaccommodation would be done in a manner that would be advantageous to existing licensees, not disrupt their present communications requirements, and foster introduction of new services using emerging technologies. The Commission set forth a regulatory framework to promote voluntary negotiation between fixed and mobile licensees and relocation of incumbent fixed microwave facilities where necessary.

4. In the Notice of Proposed Rule Making (Notice) we proposed to make available for relocation of existing 2 GHz licensees the 3.7-4.2 GHz (4 GHz), 5.925-6.425 GHz (lower 6 GHz), 6.525-6.875 GHz (upper 6 GHz), 10.7-11.7 GHz (11 GHz), 11.7-12.2, 12.7-13.25, and 17.7-19.7 GHz bands. To provide for this relocation, we proposed a "blanket" waiver of the eligibility requirements in these bands and to apply the technical rules and coordination procedures for each of these bands to the relocated operations.<sup>3</sup>

5. In response to the Notice, the Utilities Telecommunications Council (UTC) and Alcatel Network Systems, Inc. (Alcatel) filed petitions for rule making (RMs 7981 and 8004, respectively). UTC and Alcatel argued that instead of proceeding by waiver the Commission should adopt specific channelization plans and technical rules to accommodate the 2 GHz private and common carrier fixed stations potentially affected by the proposals contained in the Notice. We agreed, and adopted a Further Notice of Proposed Rule Making (Further Notice) amending our original proposal to suggest specific rules to make available the 4, 6, 10.565-10.615/10.630-10.680 (10 GHz)<sup>4</sup>, and 11 GHz bands for use by 2 GHz licensees.<sup>5</sup> We also proposed a rechannelization plan identical to that proposed in RM-8004, and made the following additional proposals:

- 1) Permit aggregation of multiple contiguous channels provided minimum use requirements are met.
- 2) Permit expansion of existing microwave systems under current channelization plans without waiver.

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<sup>3</sup> Notice of Proposed Rule Making, ET Docket No. 92-9, 7 FCC Rcd 1542 (1992). We also invited comment on the feasibility of making available to 2 GHz fixed users a portion of the 1710-1850 MHz government band. Subsequently, we solicited public comment on the NTIA report entitled "Federal Spectrum Usage of the 1710-1850 and 2200-2290 MHz Bands;" see Public Notice, Mimeo No. 22951, released May 4, 1992.

<sup>4</sup> In its petition, Alcatel proposed that the 10 GHz band be redesignated from point-to-multipoint to point-to-point use.

<sup>5</sup> Further Notice of Proposed Rule Making, ET Docket No. 92-9, 7 FCC Rcd 6100 (1992).

3) Maintain existing coordination procedures and interference standards in each band.

4) Adopt performance and loading standards for digital modulation while maintaining existing voice channel loading requirements and standards for analog modulation.

5) Clarify the automatic transmit power control (ATPC) rules.

6. In the Further Notice we also solicited comment on other technical rules and on imposing time limits for the reservation of growth channels by frequency coordinators. Finally, we stated that we would explore with the National Telecommunications and Information Administration (NTIA) the feasibility of non-government fixed microwave users accessing the 1710-1850 MHz and 3.6-3.7 GHz government bands.

7. Comments were received on the Further Notice in December 1992 and reply comments were received in January 1993. In their comments, the Telecommunications Industry Association, Fixed Point-to-Point Communications Section (TIA) and three U.S. equipment manufacturers [Harris Corporation-Farion Division (Harris), Digital Microwave Corporation (DMC), and Telesciences, Inc. (Telesciences); Harris, DMC, and Telesciences collectively referred to as the Joint Commenters] propose channel plans substantially different from those proposed in the Further Notice, contending that the proposed plans are spectrally inefficient and anti-competitive. In May 1993, Alcatel submitted supplemental comments in which it proposes a revised channel plan that would combine elements of the channel plans proposed in the Further Notice and those of the TIA and Joint Commenters. We accepted this pleading and requested comment on it by June 14, 1993.<sup>6</sup>

#### DISCUSSION

8. In general, parties support a co-primary allocation of the 4, 6, 10, and 11 GHz bands to private and common carrier fixed microwave services using Alcatel's revised channel plan. However, several satellite users of the 4 GHz band object to any 4 GHz rechannelization, with some also objecting to the proposed reallocation; and SR Telecom (SRT), a manufacturer of point-to-multipoint equipment, objects to the proposed 10 GHz reallocation. American Telephone and Telegraph Company (AT&T), MCI Telecommunications Corporation (MCI), National Spectrum Managers Association, Inc. (NSMA), and Western Telecommunications, Inc. (WTCI) offer alternative channel plans in the 4, 6, and 11 GHz bands.

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<sup>6</sup> See Public Notice, May 28, 1993, DA 93-603.

## Allocation and Channelization

9. 4 GHz. The 4 GHz band is currently allocated for common carrier fixed and fixed satellite use and is channelized into twelve 20 MHz channel pairs for fixed use. In the Further Notice, we proposed to amend the allocation to include private fixed use on a co-primary basis; and overlap the 20 MHz channel pairs with channels ranging from 400 kHz to 10 MHz.<sup>7</sup>

10. Some satellite users express skepticism about the proposed reallocation. GE American Communications, Inc. (GEAC) states that permitting any migration of 2 GHz microwave licensees to the 4 GHz band would inflict intolerable interference on satellite services. According to GEAC, even if the Commission were to protect existing licensed earth stations against degradation in signal quality, the proposed reallocation would thwart expansion of licensed stations and not protect unlicensed stations. The Satellite Broadcasting and Communications Association (SBCA) concurs, stating that the addition of private microwave users to the 4 GHz band would aggravate terrestrial interference to the nearly four million unlicensed home satellite dishes in this band.

11. Other satellite users, as well as terrestrial users, do not object to the proposed reallocation, but oppose the proposed channel plan. Home Box Office (HBO) contends that rechannelizing the 4 GHz band as proposed would cause irreparable interference to every satellite transponder in this band, since the proposed plan would position terrestrial sources of interference at varying bandwidths from the center frequencies of the transponders. National Public Radio (NPR) states that the proposed channel plan would not accommodate its Public Radio Satellite Interconnection System, the primary artery for satellite distribution of public radio programming in the United States. WTCI, a terrestrial carrier, opposes the proposed channel plan because existing common carrier fixed microwave systems would have to convert their existing equipment to the new plan.

12. TIA and the Joint Commenters propose rechannelizing the band to incorporate 40 MHz channels using the existing 20 MHz channel plan. This plan would retain the twelve existing 20 MHz pairs while adding six overlapping 40 MHz pairs and eliminating all other proposed bandwidths. According to TIA and the Joint Commenters, the 4 GHz band is not the preferred location for displaced narrowband 2 GHz users due to the potential for interference with satellite operations, but it could be used for such high capacity purposes as cellular radio backhaul to major switching centers and future broadband network services.

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<sup>7</sup> Specifically, we proposed twenty-four 400 kHz pairs, twelve 800 kHz pairs, twenty-four 1.6 MHz pairs, twelve 3.2 MHz pairs, six 5 MHz pairs, and twenty-five 10 MHz pairs.

Northern Telecom (Northern) suggests a similar channel plan, stating that the 4 GHz band should be retained exclusively for high capacity systems, but that 40 MHz channels could be derived from the existing 20 MHz plan. According to Northern, the use of 40 MHz channels would provide a significant advantage, since extremely efficient 40 MHz radios have recently become available.

13. MCI agrees that six 40 MHz pairs should be added to the existing 4 GHz channel plan, but also recommends eliminating many of the narrowband channels so that only a limited number of 400 kHz, 800 kHz, and 1.6 MHz channels are included. According to MCI, 40 MHz microwave equipment is becoming available that spectrally is highly efficient and compatible with synchronous optical networks, and this technology cannot be implemented effectively within narrower channels. AT&T, on the other hand, proposes an alternative channel plan that increases the number of narrowband channels to accommodate cellular and planned Personal Communications Services (PCS) links between cell sites and central offices.

14. In reply comments, Alcatel submitted a revised plan that proposed centering narrowband channels on the same frequencies as the existing 20 MHz channels. In its supplemental pleading, Alcatel submitted a further revision that includes only 10 and 20 MHz channels. According to Alcatel, by eliminating the narrowband channels, this plan would not affect most satellite users of the 4 GHz band.

15. The American Petroleum Institute (API) objects to plans that would eliminate channel bandwidths narrower than 10 MHz. According to API, there are over 13,000 low capacity fixed links in the 2 GHz band that must be relocated, and some of these will need to operate at 4 GHz. However, satellite users generally express concern about narrowband, as well as wideband, channels. While NPR states that Alcatel's final plan addresses its concerns, HBO, SBCA, and GTE Service Corporation (GTE) oppose permitting channels of any bandwidth other than 20 MHz. According to GTE, any new channels would operate co-channel with satellite transponder downlink services and eliminate the interference isolation between terrestrial and satellite services that is an inherent feature of the existing 20 MHz channel plan. HBO and GEAC contend that Alcatel's plan does not adequately protect digital transmissions in the 4 GHz band.

16. Based on the parties' comments, we conclude that the existing 20 MHz channel plan should not be modified. While ideally we would like to accommodate both narrowband and wideband channels at 4 GHz, under all of the proposed plans there exists the possibility of interference to the currently-licensed satellite operations. Further, these satellite operations make it unlikely that more than a small amount of new use would be achieved without causing interference. However, we continue to believe it is feasible to permit private as well as common carrier microwave use of the band under the existing channel

plan. Coordination between satellite and terrestrial users can accommodate additional use by terrestrial users, possibly including paths that would be difficult to accommodate in higher bands. Accordingly, we will authorize use of the 4 GHz band by private fixed microwave licensees in addition to common carrier fixed microwave licensees, but decline to change the channelization of the band.

17. 6 GHz. In the Further Notice, we proposed in the lower 6 GHz band to amend the common carrier fixed and fixed satellite allocations to include private fixed use on a co-primary basis; and rechannelize from the current eight 29.65 MHz channel pairs to overlapping twenty-four 400 kHz pairs, twelve 800 kHz pairs, forty-two 1.6 MHz pairs, twenty 3.2 MHz pairs, twelve 5 MHz pairs, twenty-four 10 MHz pairs, and eight 30 MHz pairs. In the upper 6 GHz band, we proposed to amend the private fixed allocation to include common carrier fixed use on a co-primary basis; and rechannelize from the current five 800 kHz pairs, three 1.6 MHz pairs, fifteen 5 MHz pairs, and sixteen 10 MHz pairs to an overlapping twelve 400 kHz pairs, six 800 kHz pairs, forty-five 1.6 MHz pairs, fifteen 5 MHz pairs, and sixteen 10 MHz pairs.

18. In lieu of this 1.6 MHz-based channelization plan, TIA and the Joint Commenters propose a 1.25 MHz-based plan. The Joint Commenters<sup>8</sup> propose rechannelizing the lower 6 GHz band into fifty-six 1.25 MHz channel pairs, twenty-eight 2.5 MHz pairs, sixteen 3.75 MHz pairs, twelve 5 MHz pairs, twenty-four 10 MHz pairs, sixteen 15 MHz pairs, and eight 30 MHz pairs<sup>9</sup>; and the upper 6 GHz band into one hundred thirty 1.25 MHz pairs, sixty-five 2.5 MHz pairs, forty-two 3.75 MHz pairs, thirty-one 5 MHz pairs, and sixteen 10 MHz pairs.

19. TIA and the Joint Commenters maintain that we should adopt their alternative proposal because:

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<sup>8</sup> The TIA plan is very similar to the Joint Commenters plan in all bands. For simplicity, only the Joint Commenters plan is addressed herein.

<sup>9</sup> These figures are the authorized bandwidths; the channel spacings would be slightly less and conform to the existing lower 6 GHz 29.65 MHz channel plan. Specifically, the channel spacings would be 1.23, 2.47, 3.70, 4.94, 9.88, 14.82, and 29.65 MHz, respectively.

1) the majority of U.S. manufacturers do not produce equipment compatible with the Further Notice's 1.6 MHz-based channel plan, and that the proposed plan therefore would place these manufacturers at a competitive disadvantage and impose additional costs on users;

2) a 1.6 MHz-based plan would degrade system performance and increase the cost of relocating 2 GHz licensees by imposing an unduly strict spectral efficiency standard for narrowband (less than 5 MHz bandwidth) channels;

3) spectrum would be used inefficiently by nearly 7000 licensed 3.5 MHz facilities in the 2110-2130/2160-2180 MHz bands that would have to be accommodated in 5 MHz channels under a 1.6 MHz-based plan;

4) spectrum would also be used inefficiently because under a 1.6 MHz-based plan large spectrum remnants would be left when microwave systems aggregate channels and expand from 1.6 MHz to greater bandwidth;

5) the proposed 400 and 800 kHz channels are not needed because these channels would not be cost-effective in higher bands; and

6) a 1.6 MHz plan would be inconsistent with international band plans.

20. In reply comments, Alcatel disputes TIA and the Joint Commenters, asserting that the proposed 1.6 MHz-based channel plan is more spectrally efficient and flexible than a 1.25 MHz-based plan. It contends that a 1.6 MHz-based plan would not impair competition because all manufacturers could easily transition to equipment based upon this plan. Also, Alcatel states that the spectrum efficiency standard upon which the proposed narrowband channel plan is based uses well-established technologies.<sup>10</sup> However, it concurs that the existing

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<sup>10</sup> In its reply comments, Alcatel contends that the proposed 1.6 MHz-based channel plan would use 8-year old 64 quadrature amplitude modulation (QAM) or 49 quadrature partial response (QPR) modem technology in channel bandwidths up to 20 MHz, and 12-year old 16 QAM or 25 QPR modem technology in channel bandwidths of 30 and 40 MHz. This plan would permit the accommodation of 24 voice circuits (DS-1 utilization) in 400 kHz channels, 48 voice circuits (2 DS-1) in 800 kHz channels, 96 voice circuits (4 DS-1) in 1.6 MHz channels, 192 voice circuits (8 DS-1) in 3.2 MHz channels, 288 voice circuits (12 DS-1) in 5 MHz channels, 672 voice circuits (DS-3) in 10 MHz channels, 1344 voice circuits (2 DS-3) in 20 or 30 MHz channels, and 2016 voice circuits (3 DS-3) in 40 MHz channels.



29.65 MHz channel spacing should be retained in the lower portion of the 6 GHz band.

21. In its supplemental pleading, Alcatel changes its recommendation of a 1.6 MHz-based plan and instead proposes a 1.25 MHz-based plan for use throughout the band. Although based on 1.25 MHz, as is the plan proposed by the TIA/Joint Commenters, Alcatel's plan differs from that proffered by the TIA/Joint Commenters in the following respects:

Lower 6 GHz -- Twenty-four 400 kHz channel pairs, twelve 800 kHz channel pairs, one unpaired 1.25 MHz frequency, one unpaired 2.5 MHz frequency, and three unpaired 3.75 MHz frequencies would be added; and four 3.75 MHz channel pairs and all 15 MHz channel pairs would be eliminated.

Upper 6 GHz -- Twelve 400 kHz channel pairs, six 800 kHz channel pairs, four unpaired 1.25 MHz frequencies, two unpaired 2.5 MHz frequencies, and two unpaired 3.75 MHz frequencies would be added; and twelve 3.75 MHz channel pairs would be eliminated.

Lower and Upper 6 GHz -- The location of many 1.25, 2.5, and 3.75 MHz channels would be changed; channels of the same bandwidth could be aggregated<sup>11</sup>; and spectrum efficiency requirements would be those proposed in the Further Notice for 400 and 800 kHz -- and 5 MHz and wider -- channels, and those of the

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The 1.25 MHz-based channel plan recommended by the TIA/Joint Commenters would use 16 QAM modem technology for 1.25 and 2.5 MHz channels, 32 QAM modem technology for 3.75 MHz channels, and 64 QAM modem technology for wider channels. This plan would permit the accommodation of 2 DS-1 in 1.25 MHz channels, 4 DS-1 in 2.5 MHz channels, 8 DS-1 in 3.75 MHz channels, 12 DS-1 in 5 MHz channels, DS-3 in 10 MHz channels, 2 DS-3 in 20 MHz channels, 3 DS-3 in 30 MHz channels, and 4 DS-3 (2688 voice circuits) in 40 MHz channels. Thus, the two proposed channel plans have different efficiencies for bandwidths below 5 MHz and above 20 MHz, but identical efficiencies for bandwidths of 5, 10, and 20 MHz.

<sup>11</sup> The Further Notice proposed to permit aggregation of channels, provided minimum payload capacity requirements were met, even if their bandwidths differed; e.g., 400 and 800 kHz channels could be joined to form 1.2 MHz channels. Under Alcatel's compromise proposal, only channels of the same bandwidth could be aggregated; e.g., 800 kHz channels could be joined to form 1.6 MHz channels, but 400 and 800 kHz channels could not be joined to form 1.2 MHz channels.

TIA/Joint Commenters for 1.25, 2.5, and 3.75 MHz channels.<sup>12</sup>

22. Alcatel contends that its revised 1.25 MHz-based plan would meet all of the concerns expressed by the TIA/Joint Commenters and improve frequency planning practices. According to Alcatel, adopting a 1.25 MHz-based plan would permit employing less complex 16 QAM and 32 QAM modems for 1.25, 2.5, and 3.75 MHz channels, and that this would improve path reliability and decrease cost. However, Alcatel asserts that 400 and 800 kHz channels should be added to the plan to permit low capacity requirements to be efficiently satisfied. It states that since approximately 16% of the more than 21,000 licensed analog frequencies in the 1850-1990 MHz and 2130-2150/2180-2200 MHz bands carry only 24 voice circuits and an additional 21% carry only 48 voice circuits, 400 and 800 kHz channels are all that are required to accommodate approximately 37% of existing 2 GHz facilities. Moreover, according to Alcatel, 15 MHz channels would be inefficient because they are proposed to accommodate the same number of voice circuits (672) as 10 MHz channels. Therefore, Alcatel recommends that 15 MHz channels be eliminated. Finally, Alcatel contends that a large number of narrowband channels, particularly 3.75 MHz channels, need to be repositioned to allow for future growth and to avoid frequency offsets that cause carrier beat problems with analog radios.<sup>13</sup> It states that under the TIA/Joint Commenters plan capacity upgrades usually would require a frequency or polarization change, whereas under its plan aggregated channels of the same bandwidth could permit system growth without frequency or polarization changes.

23. API and UTC express concern that the adopted plan have a sufficient mix of narrowband and wideband channels, including channels as narrow as 800 kHz. They propose that if the channel scheme adopted does not contain 800 kHz channels, the Commission should permit systems requiring 800 kHz capacity to use larger bandwidth channels, such as 1.25 MHz. However, while API also supports the adoption of a channel plan that includes 400 kHz channels or the accommodation of 400 kHz requirements in 1.25 MHz

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<sup>12</sup> Thus, a 400 kHz channel would accommodate 24 voice circuits, an 800 kHz or 1.25 MHz channel would accommodate 48 voice circuits, a 2.5 MHz channel would accommodate 96 voice circuits, a 3.75 MHz channel would accommodate 192 voice channels, a 5 MHz channel would accommodate 288 voice circuits, a 10 MHz channel would accommodate 672 voice circuits, a 20 or 30 MHz channel would accommodate 1344 voice circuits, and a 40 MHz channel would accommodate 2016 voice circuits.

<sup>13</sup> Alcatel's proposed repositioning would eliminate sixteen 3.75 MHz channel pairs and add unpaired 1.25, 2.5, and 3.75 MHz frequencies that could be used in one-way systems or as half of a channel pair if another paired frequency were blocked.

channels, UTC says that there is no need for 400 kHz channels, since the minimum bandwidth of 2 GHz fixed systems is 800 kHz.

24. MCI recommends its own plan wherein the band edge spectrum in the lower 6 GHz band would accommodate several 400 kHz, 800 kHz, and 1.6 MHz channels, and the main body of the band would accommodate 20, 30, and 40 MHz channels; and the upper 6 GHz band would accommodate 5 and 10 MHz channels. According to MCI, the channel plan proposed in the Further Notice unnecessarily reduces the number of wideband channels in the lower 6 GHz band. AT&T, Northern, NSMA, Pacific Telesis Group (Pacific), US West, and WTCI express similar concerns. Pacific states that under the plan proposed in the Further Notice, narrowband use could balkanize this band to such an extent that wideband channels in or near metropolitan areas would virtually disappear.

25. The United States Telephone Association (USTA) says that the proposed lower 6 GHz rechannelization from 29.65 to 30 MHz spacing would create a potential beat interference potential between analog systems. USTA therefore recommends that analog systems use the upper 6 GHz band, particularly if the system requires 10 MHz or less of bandwidth. According to USTA, this would preserve the lower 6 GHz band for wideband use. EMI Communications Corporation (EMI) and MRC Telecommunications, Inc. (MRC) recommend that 29.65 MHz channel spacing be retained in place of the proposed 30 MHz spacing to avoid interference. MRC asserts that even if the existing 29.65 MHz channel spacing plan is grandfathered, new licensees that use 30 MHz spacing would significantly change the interference environment, creating incompatible and inefficient use of the lower 6 GHz band.

26. In comments on Alcatel's supplemental pleading, a number of parties offer support for its revised plan, with most of the remaining parties expressing opposition to only a specific provision or two. API, the Joint Commenters, Microwave Networks Incorporated (MNI), Pacific, TIA, and US West endorse the plan either entirely or with minor reservations. Pacific and US West state that the plan is a major improvement over both the plan proposed in the Further Notice and the TIA/Joint Commenters plan because it eliminates narrowband channels blocking more efficient wideband channels. However, Pacific favors permitting 15 MHz channels to be used because it maintains that 10 MHz radios that meet the efficiency standards proposed in the Further Notice are insufficiently robust for some applications. Therefore, it recommends 15 MHz radios for these applications.

27. A few parties continue to express opposition to some aspects of the revised plan. MCI remains opposed to making wideband channels available for narrowband use in the lower 6 GHz band, stating that this band is a model of efficient spectrum use by wideband systems. Comsearch states that the revised plan includes an excessive number of narrowband channels and expresses

skepticism about Alcatel's proposal to aggregate channels.<sup>14</sup> Comsearch states that if aggregation becomes the norm, numerous channel combinations will be created that will be difficult to engineer and administer. MNI and TIA concur with Comsearch on this point and recommend that aggregation be allowed only when no other channels are available, and then only on center frequencies.

28. We conclude that, with the minor change recommended by MNI and TIA regarding aggregation of channels,<sup>15</sup> the revised Alcatel plan is the best alternative for the 6 GHz band. We believe that 6 GHz will be the primary relocation band for 2 GHz licensees, and therefore efficiently accommodating these licensees in this band is of utmost importance. In order to accomplish this task, there is a need to provide for low, medium, and high capacity requirements; and also to provide spectrum for future growth of systems using each of these capacities. The revised 1.25 MHz-based plan permits the accommodation of low capacity 2 GHz licensees in 400<sup>16</sup> and 800 kHz, rather than 1.25 MHz channels, and offers substantial flexibility for systems to grow both through aggregation of like-bandwidth channels and upgraded modem technology.<sup>17</sup> Further, the plan allows lower cost modems to be used for 1.25, 2.5, and 3.75 MHz channels, and permits the accommodation of the nearly 7000 3.5 MHz licensed 2 GHz facilities in 3.75 MHz channels. The plan also eliminates 15 MHz channels that would inhibit long-term efficient use of the band.<sup>18</sup> Finally, by making possible reuse of existing modems

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<sup>14</sup> Comsearch filed comments to Alcatel's supplemental pleading one day late, due to what it asserts was a failure of its delivery service to timely file the comments. We are herein accepting Comsearch's late-filed comments and have considered them in arriving at our decision.

<sup>15</sup> This change is also being made in the 10 and 11 GHz bands.

<sup>16</sup> While the minimum bandwidth at 2 GHz is 800 kHz, Alcatel's assertion that 16% of analog 2 GHz fixed systems accommodate only 24 voice circuits was not disputed. Therefore, under the channel plan being adopted herein, these systems can be accommodated in 400 kHz channels.

<sup>17</sup> For example, a facility accommodating 48 voice circuits in a 1.25 MHz channel could grow via aggregation of three 1.25 MHz channels to a 3.75 MHz channel accommodating 192 voice circuits; and, changing to 128 QAM modulation accommodate 288 voice circuits in the same 3.75 MHz channel. Thus, in this example, using both aggregation and upgraded technology would double spectrum efficiency.

<sup>18</sup> However, during the 3.5 year transition period specified in paragraph 53, infra, 15 MHz channels may be used.

by all manufacturers and minimizing the amount of existing equipment that is rendered obsolete, the plan will promote competition and not provide a short-term advantage to any manufacturer.<sup>19</sup>

29. We recognize that existing wideband common carrier licensees of the lower 6 GHz band are apprehensive about new narrowband use of the band. However, as noted by Pacific and US West, the channel plan that we are adopting permits efficient use by both wideband and narrowband users. Further, as recommended by several parties, we are retaining 29.65 MHz channel spacing in this band rather than the proposed 30 MHz spacing. This will eliminate the potential interference to analog systems discussed by USTA. Therefore, we see no need to restrict analog systems to the upper 6 GHz band. Accordingly, we are adopting our proposed 6 GHz reallocation and will use the revised 1.25 MHz-based channel plan as discussed above and as set forth in Appendix A.

30. 10 GHz. In the Further Notice, we proposed to reallocate this band from private and common carrier point-to-multipoint (Digital Termination Service (DTS) and Digital Electronic Message Service (DEMS), respectively) use to private and common carrier point-to-point fixed use on a co-primary basis; and channelize into an overlapping twenty-four 400 kHz pairs, twelve 800 kHz pairs, thirty 1.6 MHz pairs, twenty 2.5 MHz pairs, and eight 5 MHz pairs.

31. SRT argues that our proposal to eliminate the band from point-to-multipoint use is premature and ill-advised. SRT says that it is developing reasonably-priced, spectrally-efficient Time Division Multiple Access equipment for point-to-multipoint systems at 10 GHz that will satisfy latent demand that has gone unmet due to the high cost of currently-available equipment. While SRT acknowledges that point-to-multipoint spectrum is available in the 18 GHz band, it says that equipment in this band is very expensive. Therefore, in SRT's view, the Commission should retain the 10 GHz band for point-to-multipoint use, or alternatively, either reallocate the band for shared point-to-point and point-to-multipoint use or designate some channels for exclusive point-to-multipoint use.

32. Alcatel disagrees with SRT, stating that using the 18 GHz band for point-to-multipoint use is feasible and that future PCS systems will also provide point-to-multipoint service. Alcatel asserts that co-primary sharing of the 10 GHz band by

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<sup>19</sup> Alcatel's original plan would have rendered obsolete a 6 GHz radio manufactured by Telesciences that will be usable under the revised plan. While the revised plan does obsolete several radios manufactured by various companies, all of this equipment except a 15 MHz Harris radio would also be obsolete under the TIA/Joint Commenters plan.

point-to-point and point-to-multipoint systems would present extremely difficult frequency coordination problems, since the latter transmit omnidirectionally over a large geographic area, thus preempting point-to-point use. Further, according to Alcatel, 18 GHz point-to-multipoint equipment is less expensive than comparable 10 GHz equipment.

33. Comsearch states that prior coordination and licensing of 10 GHz point-to-multipoint end user locations should be required, so that point-to-point users are not precluded from large portions of the band. The Bell Atlantic Companies (Bell Atlantic) disagree, stating that Comsearch's proposal could result in a displaced 2 GHz microwave licensee blocking a point-to-multipoint user from expanding. Bell Atlantic recommends that we adopt our proposal to preserve the ability of point-to-multipoint operators to continue to provide full service capabilities to end users. NSMA generally concurs with Bell Atlantic's comments.

34. TIA and the Joint Commenters contend that the Commission's proposal to introduce a 1.6 MHz-based channel plan at 10 GHz while retaining the 1.25 MHz-based plan that is currently used in the 10.550-10.565/10.615-10.630 GHz point-to-point portions of the 10.550-10.680 GHz band would substantially reduce the number of available channels. The Joint Commenters state that if the Commission's 10 GHz proposal is adopted, point-to-point users would be licensed under two channel plans and that a licensee's use of channels under the first plan would limit another licensee's ability to use channels under the second plan. According to the Joint Commenters, such a dual channel plan would result in 2.6 MHz of unusable spectrum remnants. Therefore, the Joint Commenters propose that the 1.25 MHz-based plan be retained throughout the 10.550-10.680 GHz band. Specifically, the Joint Commenters propose that this band be rechannelized to:

- 1) expand the number of 1.25 MHz channel pairs from four to fifty-two;
- 2) expand the number of 2.5 MHz channel pairs from six to twenty-six;
- 3) expand the number of 3.75 MHz channel pairs from four to seventeen; and
- 4) add thirteen 5 MHz channel pairs.

35. In its supplemental pleading, Alcatel replies that while a 1.6 MHz-based plan is more efficient than a 1.25 MHz-based plan at 10 GHz, it is willing to accept a revised 1.25 MHz-based plan similar to its revised plan at 6 GHz. Specifically, its 10 GHz plan proposes to permit aggregation of like-bandwidth channels and to use the same spectrum efficiency standards as at 6 GHz. It also proposes to:

- 1) add twenty-four 400 kHz channel pairs and twelve 800 kHz channel pairs;
- 2) eliminate six 3.75 MHz channel pairs and two 5 MHz channel pairs; and
- 3) relocate a number of 3.75 MHz channels.

36. TIA and the Joint Commenters generally support Alcatel's revisions. UTC, however, recommends that 400 kHz channels be eliminated from the plan, based on its belief that they are unnecessary and not cost-effective.

37. Regarding our proposal to redesignate the 10 GHz band from point-to-multipoint to point-to-point use, we find no support for SRT's contention that the 18 GHz band is not viable for point-to-multipoint use. Reasonably-priced equipment can be developed at 18 GHz that will accommodate the likely point-to-multipoint demand. We also do not want to disadvantage existing 10 GHz DTS and DEMS licensees, and therefore will permit existing 10 GHz DTS and DEMS systems to expand to include additional end user locations on existing channels and to add channels in authorized service areas. However, to minimize the possibility of interference between point-to-point and grandfathered DTS and DEMS systems, we will require grandfathered DTS and DEMS licensees to prior frequency coordinate with point-to-point licensees pursuant to Section 21.100(d).<sup>20</sup> We are not accepting 10 GHz DTS and DEMS systems applications for new service areas.

38. With regard to channelizing the 10 GHz band, we concur with TIA and the Joint Commenters that a 1.25 MHz-based channel plan is superior to a 1.6 MHz-based plan. As they note, current point-to-point use in adjacent spectrum is based upon a 1.25 MHz plan, and introducing a 1.6 MHz-based plan could create confusion and inefficiency, as well as rendering several existing 1.25 MHz-based radios in the 10.550-10.565/10.615-10.630 GHz bands unusable in the 10.565-10.615 and 10.630-10.680 GHz bands.<sup>21</sup> Additionally, while the U.S. is not obligated to follow international band plans, a 1.6 MHz plan would be inconsistent with the 10 GHz plan recommended by the Consultative Committee International for Radio.<sup>22</sup> Regarding which proposed 1.25 MHz-

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<sup>20</sup> Grandfathered DTS and DEMS systems are those systems that are licensed, in operation, or have applications pending prior to July 15, 1993.

<sup>21</sup> The Joint Commenters manufacture six 10 GHz radios that are usable under a 1.25 MHz plan, but that would be unusable under a 1.6 MHz-based plan.

<sup>22</sup> This Committee is now the International Telecommunication Union Radiocommunications Sector Study Group.

based plan is more desirable, we find merit in Alcatel's revised plan for reasons similar to those discussed in our 6 GHz decision, supra. While we anticipate that most low capacity 2 GHz licensees will choose to relocate to the 6 GHz band, we believe it prudent to provide additional 400 and 800 kHz channels at 10 GHz. Moreover, there may be new low capacity requirements, such as interconnecting future PCS cell sites. Alcatel's latest plan also would better provide for system growth by repositioning some 3.75 MHz channels and permitting aggregation of like-bandwidth channels. Accordingly, we are adopting our proposed 10 GHz reallocation and will use a revised 1.25 MHz-based channel plan as set forth in Appendix A.

39. 11 GHz. In the Further Notice, we proposed to amend the common carrier fixed allocation in the 11 GHz band to include private fixed use on a co-primary basis; and to rechannelize from twelve 40 MHz pairs to overlapping fifty 10 MHz pairs and sixteen 30 MHz pairs. TIA and the Joint Commenters recommend that the Commission make available a wide range of narrowband and wideband channels. Specifically, the Joint Commenters propose that the band be channelized into seventy-six 1.25 MHz channel pairs, thirty-eight 2.5 MHz pairs, twenty-four 3.75 MHz pairs, nineteen 5 MHz pairs, fifty 10 MHz pairs, twenty-four 20 MHz pairs, thirteen 30 MHz pairs, and twelve 40 MHz pairs. TIA and the Joint Commenters argue that this channel plan will encourage greater utilization of the 11 GHz band. Northern offers some support for this plan, stating that while it is reluctant to support narrowband and wideband channel use of the same band, sharing two 40 MHz pairs with 1.25, 2.5, 3.75, 5, and 10 MHz pairs may be feasible, and is more desirable at 11 GHz than at 4 or 6 GHz. MCI also recommends a mix of narrowband and wideband channels similar to its proposed 4 and 6 GHz channel plans, wherein the band edge spectrum would accommodate several 400, 800, and 1600 kHz channel pairs, and the main body of the band would be fully channelized with 20, 30, and 40 MHz channels.

40. Several parties favor retaining the 11 GHz band exclusively for wideband channel use. AT&T, NSMA, Pacific, US West, and WTCI express concern that neither the channel plan proposed in the Further Notice nor the TIA/Joint Commenters plan adequately accommodates the needs of existing wideband common carrier users. NSMA and WCTI propose retaining the existing 40 MHz channel plan and state that the existing plan is compatible with new spectrum-efficient communications services.

41. Alcatel argues that narrowband channels at 11 GHz are not as desirable as in lower bands, since the band is affected by rain outage. In its supplemental pleading, it asserts that the 11 GHz plan proposed in the Further Notice is the most efficient, but that in view of the need expressed in the comments for narrowband and 40 MHz channels, it proposes a revised plan that is similar to the Joint Commenters' except for:



1) permitting aggregation of like-bandwidth channels and using the same spectrum efficiency standards as at 6 and 10 GHz;

2) eliminating twenty 1.25 MHz channel pairs, ten 2.5 MHz channel pairs, ten 3.75 MHz channel pairs, five 5 MHz channel pairs, and all 20 MHz channel pairs; and

3) relocating a number of channels.

42. Pacific and US West state that Alcatel's revised plan largely eliminates their concerns because it permits much more efficient use of wideband channels.<sup>23</sup> TIA and the Joint Commenters also support the revised Alcatel plan, but MCI opposes it, contending that it would permit the availability of fewer 30 MHz pairs than MCI requires.

43. We believe that flexibility is desirable and that there is merit in permitting a wide range of narrowband and wideband channels at 11 GHz. While a number of parties correctly observe that eliminating or restricting narrowband channels from the 11 GHz plan would better accommodate wideband users, the same is true in the 6 and 10 GHz bands. Our goal is not to favor either narrowband or wideband users, but to treat each group equitably. While this means that a flexible channel plan may not be ideal for any one user, we find that it is desirable for all users combined. Accordingly, we are adopting our proposed 11 GHz reallocation proposal and will use a revised 1.25 MHz-based channel plan, as set forth in Appendix A.

44. Minimum Channel Loading and Data Rates. In the Further Notice, we proposed changes to Sections 21.122(a)(2) and 94.94 to require the following minimum data rates in the 4, 6, 10, and 11 GHz bands for systems using digital modulation:

<u>Channel Bandwidth</u>	<u>Minimum Data Rate (Megabits per Second)</u>
400 kHz	1.54 (DS-1 utilization).
800 kHz	3.08 (2 DS-1 utilization)
1.6 MHz	6.17 (4 DS-1 utilization)
3.2 MHz	12.3 (8 DS-1 utilization)
5.0 MHz	18.5 (12 DS-1 utilization)
10 MHz	44.7 (DS-3 utilization)
20 and 30 MHz	89.4 (2 DS-3 utilization).

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<sup>23</sup> To permit greater system gain, Pacific makes the same recommendation at 11 GHz as it did at 6 GHz; namely, that 15 MHz radios should be allowed to operate under the proposed efficiency requirements for 10 MHz radios. For the reason given in paragraph 28, supra, we are not adopting this proposal; however, as mentioned in note 18, supra, 15 MHz channels will be permitted during the 3.5 year transition period.

45. Additionally, we proposed that digital systems using bandwidths of 10 MHz and greater be required to load to at least 50% of capacity. Finally, we proposed no change to Section 21.710(c) of the rules, which provides that microwave systems must meet a minimum loading requirement of 900 voice channels (4 kHz or equivalent) within five years, or operate at a minimum data rate of 10 Mb/s in the 4, 6, and 11 GHz common carrier bands.<sup>24</sup> Where transmitters employing digital modulation techniques are designed to be used so that two may simultaneously operate on the same frequency over the same path, the minimum number of voice channels is reduced to 500.

46. EMI and Motorola, Inc. express concern that some 2 GHz microwave users may be disadvantaged or discouraged from relocating to bands above 3 GHz by the above loading standards. Motorola urges the Commission to announce a liberal loading standard waiver policy for existing 2 GHz licensees that are relocated. UTC argues that wideband common carrier loading standards will be particularly burdensome on narrowband private users, and proposes that the Commission not require loading standards for private microwave systems operating in any of the bands above 3 GHz or, alternatively, not enforce loading standards on private systems occupying bandwidths of less than 10 MHz. UTC recommends that if loading standards are adopted for private systems, they be based on loading after five years.

47. TIA and the Joint Commenters state that applicants for wideband channels (10 MHz and greater) should be required to submit more extensive justification than other applicants; e.g., that their stated requirements cannot be met with a narrower channel, that they will be able to satisfy the loading requirement for wideband channels, and -- for Part 94 applicants who plan to resell excess capacity -- that they submit contracts with their applications as evidence of demand for such capacity. Further, TIA and the Joint Commenters recommend that wideband channel applicants be required to demonstrate an immediate need for channel loading of at least 50 percent of capacity, that the Commission authorize independent auditors to examine loading of existing systems, and that the minimum digital data utilization rates for 30 and 40 MHz channels should be 3 DS-3 and 4 DS-3, respectively.

48. In reply comments, Alcatel contends that the utilization rates recommended by TIA and the Joint Commenters are too stringent to achieve desirable path reliability, and recommends that the utilization rate for 30 MHz channels be the proposed 2 DS-3 and that the rate for 40 MHz channels be 3 DS-3. In supplemental comments, TIA recommends a compromise wherein the 3 DS-3 utilization rate would apply to 40 MHz channels and 30 MHz channels in the 6 GHz band, with a 2 DS-3 rate being used for

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<sup>24</sup> For bandwidths of 20 MHz or less in the 11 GHz band, the minimums are 240 voice channels and a data rate of 5 Mb/s.

30 MHz channels in the 11 GHz band. TIA further proposes a compromise on the timing for licensees meeting the 50% wideband channel loading requirement, recommending that it be met after 2.5 years, rather than immediately.

49. US West opposes any loading standards on common carrier use of wideband channels. It contends that warehousing of spectrum is not a serious problem and that, to the extent that it occurs, can be addressed through a complaint proceeding. It also objects to the 3 DS-3 utilization requirement for 30 MHz channels recommended by TIA and the Joint Commenters, contending that this requirement would significantly increase cost and lower path reliability and transmission performance, particularly at 11 GHz, in which rain attenuation affects path availability. UTC concurs, stating that a higher efficiency requirement would limit the ability of private microwave systems to replace an analog link with a digital one in some of the more difficult path configurations, particularly in the 11 GHz band.

50. TIA and the Joint Commenters recommend that the proposed new digital efficiency requirements be implemented over a five year period to permit existing equipment to be used for a longer period of time. The Joint Commenters state that no matter which channel plan is adopted, several relatively new radios will be rendered obsolete. Northern concurs that a five year transition period is appropriate, but Alcatel states that only a two year transition period is needed. In reply comments to Alcatel's revised channel plan, TIA and MNI recommend a compromise transition period of 3.5 years.

51. The Public Broadcasting Service (PBS) expresses concern that the proposed digital data rates would be burdensome for the common carrier microwave links that soon will be needed to relay digitally encoded motion video material, such as compressed NTSC and HDTV, to broadcast satellite distribution systems. PBS states that the efficiency standard in proposed Section 21.122(a)(2) requires QAM, which cannot be used by earth stations for satellite communications due to power limitations aboard satellites. Rather, according to PBS, quadrature phase shift keyed (QPSK) modulation must be used for such communications. Therefore, PBS argues, a common carrier microwave system carrying digital motion video material to a satellite earth station would be required to use QAM for the terrestrial link and QPSK for the satellite link, adding complexity to system control and new costs to the program distribution chain. PBS notes that although satellite broadcasters usually use Part 74 broadcast auxiliary service links to connect with earth stations, sometimes they must order service from common carriers. Accordingly, it recommends an exception to proposed Section 21.122(a)(2), permitting common carrier microwave systems carrying digital motion video material to use alternative modulation, provided that they comply with the 1 bit/sec/Hz requirement of Section 21.122(a)(1).

52. We concur with the consensus of the commenters that many existing 2 GHz licensees may not easily meet the existing and proposed loading standards, and that a transition period is appropriate to permit manufacturers to meet the proposed digital data rates. However, we also want to ensure that channels are used as efficiently as possible in a timely manner. Therefore, we are maintaining our existing voice channel loading requirements and are adopting our proposed digital loading standards for channels of 10 MHz and greater bandwidth, but will liberally waive loading requirements in accommodating displaced 2 GHz licensees in the bands above 3 GHz.

53. We also are adopting our proposed digital data rates except for 30 MHz channels at 6 GHz, in which we will require the more efficient 3 DS-3 utilization rate proposed by TIA and the Joint Commenters.<sup>25</sup> We concur with them that this rate is achievable for 30 MHz channels at 6 GHz, but agree with the consensus of commenting parties that this rate is inappropriate for 30 MHz channels at 11 GHz because of the more difficult path reliability problems inherent in use of this band. Therefore, as proposed in the TIA compromise plan, we will use a 2 DS-3 rate for 30 MHz channels at 11 GHz. As also proposed by TIA in its compromise plan, we are specifying a 3.5 year transition period ending June 1, 1997 for new equipment to meet the adopted data rates; i.e., equipment that does not meet these rates must be in service, authorized, or applied for by June 1, 1997. While determining the optimum transition period is difficult, we believe a 3.5 year period is adequate, given adoption of a channel plan that permits existing modems of all manufacturers to be used. To minimize the use of equipment that does not meet the new efficiency standards, we are imposing a deadline of July 15, 1994, for the manufacture or importation of such equipment.<sup>26</sup> This deadline will permit manufacturers to exhaust inventories prior to the June 1, 1997 transition date and meet the near-term equipment needs of users, while also ensuring that less efficient equipment is phased out in an expeditious manner. The new rules are specified in Appendix A.

54. We also are adopting TIA's compromise proposal that 2.5 years be permitted for licensees of wideband (10 MHz and greater) channels to meet the 50% channel loading requirement. We believe that this period represents a reasonable middle ground between those who believe that this requirement should be met immediately and those who believe that no loading requirement is

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<sup>25</sup> We also are adopting the 3 DS-3 rate for 40 MHz channels. These channels were not proposed in the Further Notice; therefore no data rate was specified. However, Alcatel, TIA, and the Joint Commenters all support this rate and no party opposes it.

<sup>26</sup> This deadline will not apply to equipment manufactured for export.

necessary. We are not adopting the TIA/Joint Commenters proposals regarding additional requirements for use of wideband channels because we believe our loading requirements are sufficient to deter inefficient use of these channels.

55. Finally, we find PBS's proposal to permit use of alternative modulation techniques for the carriage of digital motion video material to be desirable. Its adoption would ensure that digital broadcasting satellite needs are met. No commenting party opposes this exception. Accordingly, we will permit alternative modulation to be used for this purpose, provided that the bit rate standard of Section 21.122(a)(1) is met, as specified in Appendix A.

56. Expansion of Existing Systems Under Current Channel Plans in Bands Above 3 GHz. McCaw, Northern, NSMA, Pacific, and WCTI support our proposal to permit expansion of existing microwave systems under current channel plans. According to these parties, new channels adding to existing systems must follow the previous channel plan or intra-system interference will result. Several propose that our rules be modified to make such expansion permissible. Alcatel states that system routes in existence when the Further Notice was adopted should be permitted reasonable expansion without excessive retuning; i.e., expansion of existing frequency plans should be allowed without waiver after a valid showing to the Commission.

57. We concur with the consensus expressed in the comments. While coordination between existing and future microwave systems that use different channel plans will be necessary to ensure that inter-system interference does not result, we do not believe it necessary to disadvantage existing licensees by preventing expansion of their systems. Further, since the rechannelization plans that we are adopting essentially overlay narrowband channels on existing wideband channels, such expansion is compatible with use under the revised plans. Accordingly, we are adopting our proposal to permit expansion of existing microwave systems under current channel plans, as specified in Appendix A.

58. Coordination Procedures and Interference Standards. Alcatel supports the Commission's proposal to maintain Part 21 coordination procedures and interference standards in the 4, 6, 10, and 11 GHz common carrier bands and Part 94 procedures and standards in the 6 GHz private band. API and Northern Telecom concur with respect to coordination procedures, and UTC and WCTI concur with respect to interference standards. These five parties generally maintain that existing procedures and/or standards would be least disruptive to licensees in each band. GTE supports using existing coordination procedures temporarily, but says that the Commission should set forth a plan to harmonize private and common carrier procedures.

59. TIA and the Joint Commenters recommend that both coordination procedures and interference standards be harmonized

in all bands without further delay, noting that equipment used by private and common carriers increasingly is becoming similar and that private and common carrier microwave applications are processed by the same Commission personnel. They propose that Part 21 coordination procedures be used, contending that these procedures ensure that licensees potentially affected by a proposed new licensee will be notified; and that Part 94 interference standards be used, contending that these standards have proven to provide sufficient protection and are administered by a recognized standards body (TIA TR14.11). AT&T, Comsearch, EMI, McCaw Cellular Communications, Inc., NSMA, USTA, UTC, and WTCI concur that Part 21 coordination procedures should be used in all bands. Several of these parties argue that if procedures are not made uniform, there would be an incentive for microwave users to migrate to the upper 6 GHz band, in which less stringent Part 94 procedures would remain in place.

60. We concur with the TIA/Joint Commenters' proposal to use Part 21 coordination procedures and Part 94 interference standards in all bands. Currently, the basic differences are that in common carrier bands new users must notify potentially-affected licensees of their planned use, whereas there is no such requirement in private bands; and that common carrier interference standards are somewhat less stringent than private standards. There is a clear consensus to use common carrier coordination procedures in shared bands, and common carrier and private interference standards are converging. Further, we believe it essential that one organization administer interference standards. Accordingly, we are adopting uniform Part 21 coordination procedures and Part 94 interference standards for the 4, 6, 10, and 11 GHz bands, as set forth in Appendix A.

61. Reservation of Growth Channels. The Further Notice solicited comment on whether frequency coordinators should establish time limits for the reservation of growth channels, such as a six month reservation period.<sup>27</sup> Pacific opposes limiting the period during which frequencies can be reserved for future growth to as short as six months. According to Pacific, a six-month period forecloses a carrier's ability to plan. Comsearch and EMI concur, stating that the reservation of growth channels is a necessity in the common carrier microwave industry. According to these two parties, most high capacity microwave licensees do not realize an immediate return on their investment, and that without a reservation of channels the economic incentive to build systems would disappear. Northern generally supports the current procedures for reservation of growth channels for Part 21 wideband users, but does not believe that it is necessary to reserve growth channels with less than 20 MHz bandwidth

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<sup>27</sup> Growth channels are those channels not required at present but that are anticipated to be required in the future.

because, in Northern's view, it would be more efficient to install a wideband channel.

62. TIA and the Joint Commenters disagree with the above parties, stating that reserving channels can be used to block expansion of other systems. TIA recommends that unlicensed spectrum reserved by a user be made available for licensing by others on a first come, first served basis upon a showing that no other channels can be coordinated. It further recommends that the Commission administer any reservation of growth channels. UTC generally concurs, stating that with the significant increase in bandwidth available to carriers under the proposed channelization plans, there is no need for carriers to retain the ability to reserve growth channels on an indefinite basis. In UTC's view, while coordinators should be encouraged to avoid blocking other users' access to growth spectrum, there is no reason for the Commission to institutionalize the warehousing of spectrum by permitting repeated renewals of coordination notifications. UTC suggests that the Commission amend Section 21.100(d)(2)(x) of the rules to limit the ability of licensees to renew their coordination notification to one six month period after the expiration of the original notification period, and to prohibit recoordination for at least six months if no application is filed during this twelve month period.

63. Given the necessity of accommodating additional licensees in the 4, 6, 10, and 11 GHz bands, it is essential that valuable spectrum not lie idle. While commenting parties have convinced us that mandating that channels be reserved for no more than a specific period would be arbitrary, we concur with TIA that a reserved channel should be made available to another licensee upon a showing of need. Adopting this change will permit growth channels to continue to be reserved while ensuring that the needs of all microwave licensees are met. Accordingly, we are adopting this rules change, as specified in Appendix A; however, we will continue to permit frequency coordinators to administer the reservation process and will become involved only if a dispute arises as to channel availability.

64. Antenna Standards. The Further Notice proposed antenna standards for the 10 GHz band that reflect the proposed reallocation from point-to-multipoint to point-to-point use, and listed the current standards for the 4, 6, and 11 GHz bands. MCI states that these standards must be made more stringent for category A antennas.<sup>28</sup> Otherwise, according to MCI, new narrow- bandwidth single-frequency users who do not foresee a need to expand their own systems will build paths that will block future expansion of wide-bandwidth, multiple-frequency paths licensed to others. MCI asserts that the Commission, with input

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<sup>28</sup> Category A antenna standards are used in areas of frequency congestion, while category B antenna standards are used in uncongested areas.

from manufacturers and other interested parties, could readily develop new category A requirements that permit greater spectrum reuse.

65. Comsearch agrees that category A antenna standards need to be amended, due to increasing congestion caused by introduction of private microwave systems into common carrier bands. Also, according to Comsearch, a detailed definition of congested areas or zones where only category A antennas can be used needs to be specified, and an updated list of congested private microwave areas is needed. GTE recommends that new microwave systems in the 4 and 6 GHz bands be implemented using state-of-the-art antennas, but says that antennas in existing systems should be upgraded only if using these antennas results in interference or prevents the implementation of a new service. USTA supports the development of uniform standards in all bands for both common carriers and private users. It states that allowing licensees to use category B antennas could lead to further congestion and require new entrants to coordinate around systems with sub-standard antenna systems. Therefore, it proposes that the Commission update and improve the category A standards for use by all carriers to maximize efficiency and permit full use of available bands.

66. API disagrees with the above parties, stating that the Commission should not impose new antenna standards on private microwave systems. In API's view, Part 94 licensees should be able to continue to use antennas meeting the minimum standards set forth in Section 94.75 of the rules to avoid having to change locations or replace tower structures.

67. Commenting parties have raised potentially valid concerns about our existing antenna standards. However, we do not have sufficient information at this time to propose changes to these standards. Accordingly, we are adopting the proposed standards, with some minor modifications, as specified in Appendix A, and encourage industry organizations and other interested parties to explore the need for modifying the standards in all of the reallocated bands.

68. Automatic Transmit Power Control. The Further Notice stated that ATPC is permitted under both Parts 21 and 94 of our rules provided that the change in effective radiated power (ERP) is no greater than 3 decibels (dB), and proposed to clarify this point. Northern agrees that ATPC should be explicitly authorized in the rules. Comsearch recommends that the rules be revised to include a definition of ATPC that would allow for variable power operation below a transmitter's maximum authorized power, but says that implementing ATPC should be left to frequency coordinators. In this regard, Comsearch endorses the technical guidelines developed by NSMA for the development of ATPC. NSMA requests that the Commission allow industry associations such as itself and TIA to define appropriate procedures to be used in dealing with ATPC systems during interference analysis.



Alcatel and USTA concur that established industry bodies should be permitted to establish the appropriate ATPC standards.

69. The Joint Commenters propose that the ATPC rules allow up to a 10 dB increase in power, asserting that this could permit closer spacing of microwave systems and that the potential for interference would be insignificant. However, GTE states that this large an increase in power could significantly degrade satellite system performance. It therefore proposes that ATPC systems operate with restrictions to prevent interference to satellite services. Specifically, GTE proposes that the Commission limit the difference between coordinated and licensed power and impose restrictions on the percentage of time that ATPC systems are permitted to operate above coordinated power.

70. We believe our proposal to clarify that ATPC is permitted up to a 3 dB increase in power is appropriate. However, commenting parties have raised issues that we believe can best be addressed by industry groups such as TIA and NSMA. Accordingly, we are adopting our proposed ATPC rules changes, as specified in Appendix A, and encourage industry groups to explore in greater detail under what circumstances ATPC should be authorized and whether a greater increase in power than 3 dB would be appropriate.

71. Other Technical Issues. There was little comment on our other technical proposals regarding minimum path length requirements; frequency diversity transmissions; and power, emission, and bandwidth limitations. However, Alcatel notes that the listed Section 94.73 power limitations for the 21,200 to 23,600 and 38,600 to 40,000 MHz bands differ from those currently authorized in Section 21.107, and that Section 94.73 does not list the 27,500 to 29,500 MHz band, as does Section 21.107. It therefore recommends making Section 94.73 consistent with Section 21.107. Also, MCI states that the path length and equivalent isotropic radiated power (EIRP) limitations proposed in Sections 21.710 and 94.79 do not provide a continuum for allowed EIRP at the minimum path length point. MCI therefore proposes that the step function in the allowed EIRP be eliminated.

72. Regarding Alcatel's recommendations, the listed Section 94.73 power limitations for the 21,200 to 23,600 and 38,600 to 40,000 MHz bands are those currently in effect, rather than proposals. While they differ from the power limitations authorized for the same bands under Section 21.107, these bands are not the subject of this proceeding. With respect to 27,500 to 29,500 MHz, this band is not authorized or proposed for Part 94 use. Similarly, regarding MCI's proposal, the step function that it refers to is not a proposal but currently exists in the rules. Accordingly, we are not acting upon Alcatel's or MCI's recommendations at this time, and are adopting our technical proposals regarding minimum path length requirements; frequency diversity transmissions; and power, emission, and bandwidth limitations, as specified in Appendix A. We note, however, that